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Preface

This special issue of *Linear Algebra and its Applications* honours Pauline van den Driessche, who celebrates her sixty fifth birthday in 2006. Pauline has made significant contributions to mathematics, especially in linear algebra and mathematical biology. She has been a highly regarded colleague, teacher, collaborator and mentor to many, and a cherished friend to all. We are pleased to congratulate her on this special occasion and to wish her continued success in all future endeavours.

Pauline van den Driessche and her contributions to mathematics

Pauline van den Driessche was born in 1941 in England and studied mathematics at Imperial College, University of London, where she obtained a B.Sc. and an M.Sc. in applied mathematics. Pauline completed a Ph.D. in fluid mechanics at the University College of Wales in Aberystwyth in 1964. After one year as an Assistant Lecturer at the University College of Wales, she emigrated to Canada with her husband, Robert, and joined the Department of Mathematics at the University of Victoria in 1965. She has since lived in Victoria, apart from study leaves spent in Australia, Toronto, Oxford, Munich, Bielefeld and Edmonton, and several research visits, especially to other universities in Canada. Her supportive family, which brings her great joy, includes a son Mark and a daughter Ruth, and three grandsons.

Pauline is an internationally renowned scientist who has made significant contributions in several different areas of mathematics. Her solid grounding in applied mathematics laid a foundation for her work in dynamical systems and applications. Her earlier work on differential-difference equations and Hopf bifurcations is widely known, and is still cited in the literature, a tribute to the lasting impact of her work.

Pauline is well known and internationally recognized for the depth and breadth of her work in linear algebra. She was among the earliest researchers in combinatorial matrix analysis, in which the zero-nonzero or sign pattern of a matrix is exploited in analyzing such matrix properties as stability, nonsingularity, inertia and the

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eigenstructure. This research requires a blend of both combinatorial methodology and algebraic analysis, and Pauline's adeptness in both of these fields has produced an abundance of fundamental results. Perhaps the best known and most frequently cited is her 1977 paper with Jeffries and Klee characterizing sign stability. Apart from combinatorial matrix analysis, Pauline has made significant contributions to the study of nonnegative matrices, matrix factorization, matrix stability, perturbation theory, max algebra and M-matrices. Frequently, the problems that Pauline has considered arise from applications in, for example, dynamical systems, economics and mathematical biology, where, for example, she has successfully applied the theory of M-matrices to find a general formula for basic reproduction numbers. Together with colleagues, she has also applied matrix theory to problems in chemistry and recently in anthropology.

Intrigued by the potential for applying her mathematical ideas, Pauline branched out into the field of mathematical biology, and has become one of the leading international scientists in mathematical epidemiology. Her major impact has been the application of new mathematical methods for studying the dynamics of disease. Here, the nonlinear interactions between susceptible and infected individuals play a major role in the disease outcomes, such as epidemic outbreak, oscillating endemic infection levels, or disease extinction. Her mathematical approach formulates interaction dynamics between individuals in terms of ordinary or functional differential equations. Her analysis of these model equations then gives conditions for the different outcomes, such as epidemic outbreaks. The final step in the process is to evaluate the impact of different control/vaccination methods on the disease dynamics, with a view to controlling the disease. Pauline has developed mathematical tools for all of the different steps in the formulation and analysis. These tools have made it possible for her, and other researchers, to make applications of the methods to topics such as multi-city disease dynamics, HIV/AIDS control, and, more recently, West Nile virus outbreak predictions. Recent disease threats (such as SARS and influenza) as well as massive endemic killer diseases like tuberculosis, have brought Pauline's research to the forefront. This is confirmed by her many international activities, including numerous invited lectures on disease control, workshop organization, and membership on the Advisory Board for the five year Special Focus on Computational and Mathematical Epidemiology sponsored by DIMACS.

Despite Pauline's prolific output of nearly 150 refereed journal papers, and an astounding 100 different co-authors, she will be best remembered by many as a mentor of young academics. Pauline has tirelessly devoted much time to guiding, supervising and mentoring undergraduate, graduate and post-graduate students, many of whom have gone on to stellar academic or industrial careers of their own. Her breadth of knowledge, creativity, attention to detail, enthusiasm for mathematics, patience and encouragement have combined to make her an inspiring role model. More than 20 of Pauline's 100 co-authors were students or post-doctoral fellows under her supervision.

In addition to being an active, productive researcher and mentor, Pauline has been an outstanding citizen in the mathematics community. She has been a conference organizer for more than 20 regional, national and international conferences and work-

shops; she has served as an editor of the Canadian Applied Mathematics Quarterly, the SIAM Journal of Applied Mathematics, and as a special editor for an issue of the Electronic Journal of Linear Algebra; she has reviewed countless articles for refereed journals and Mathematical Reviews. She has served on several boards and committees of the Canadian Applied Mathematics Society, the Canadian Mathematics Society, the Pacific Institute for the Mathematical Sciences, MITACS, the NSERC Grant Selection Committee, and the International Linear Algebra Society. A meeting organized in part by Pauline on Combinatorial Matrix Analysis in 1987 led to the founding of the International Matrix Group, which quickly evolved into the now well-established International Linear Algebra Society. Pauline's interest and enthusiasm for promoting mathematics even extends to elementary school children, where she has been actively involved with the MathMania program in Victoria area schools and as a judge at Science Fairs. Pauline was honored with the YM-YWCA Woman of Distinction Award: Science, Research and Environment in 1998 and won the Bellman Prize (with James Watmough) for the best paper published in Mathematical Biosciences in 2002–2003.

As a person, Pauline is compassionate, sincere and caring. The welfare and interests of her colleagues and students are always foremost in her mind. She has left her mark on the world of mathematics, and she has been a positive influence on the many people who have been fortunate to cross paths with her either mathematically or in other ways. When not doing mathematics, she may be found sailing, on a hiking trail, or most probably in a swimming pool.

The special editors of this issue wish to thank Mark Lewis, University of Alberta, for contributing to this tribute to Pauline.

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